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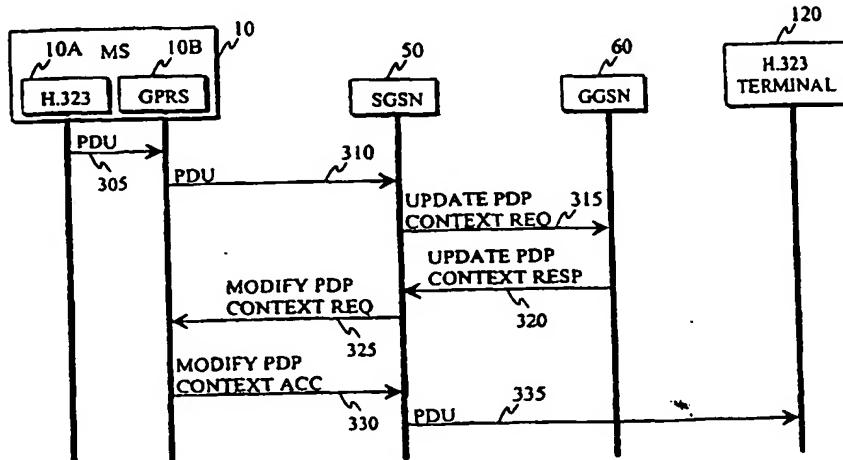
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## (54) Title: CONNECTION MANAGEMENT METHOD



## (57) Abstract

The invention is concerned generally with packet data transmission in cellular telecommunication system, and more particularly with handling of speech connections transmitted using packet data transmission. According to the invention, the GPRS system is arranged to monitor IP telephony call state change messages, which can be performed by monitoring a transport layer service access point (TSAP), which the IP telephony system uses for call state change signaling. The invention can be used with any IP telephony protocol, such as the H.323 protocol and the SIP protocol. Such a TSAP may be for example a specific UDP (User Datagram Protocol) or TCP (Transmission Control Protocol) port at the IP address corresponding to the mobile station. The monitoring may be performed for example by the GPRS control entities in the mobile station, whereby they are able to determine if a new requested packet connection will be used for a H.323 speech or video connection and negotiate and set up a PDP context having a corresponding level of service. Monitoring in the mobile station is advantageous in mobile originated H.323 calls. The monitoring may as well be performed by a GSN, which is advantageous for mobile terminated H.323 connections.

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**Connection management method****Technical field of the invention**

5 The invention is concerned generally with packet data transmission in cellular telecommunication system, and more particularly with handling of speech connections transmitted using packet data transmission. Specifically, the invention is directed to a method according to the preamble of claim 1:

**Background of the invention****A. The GPRS system**

10 The GPRS (General Packet Radio Service) system is intended for transmission of data using packet switched connections. The GPRS system is designed to be added to existing GSM networks. It will also be used in the UMTS (Universal Mobile Telecommunication System). The packet data services provided by the GPRS system are ideal for non-real-time services, such as for example e-mail or file 15 transfer services. In the following, the structure of a GPRS system is described with reference to figure 1.

20 The GPRS system introduces two new network elements as compared to the GSM framework, i.e. two types of GPRS Support Nodes (GSN) 50, 60: the Serving GPRS Support Node (SGSN) 50 and the Gateway GPRS Support Node (GGSN) 60. The SGSN 50 is at the same hierarchical level as the MSC (Mobile Services Switching Center) 40. The main task of a SGSN is to serve mobile stations 10, i.e. to keep track of the location of mobile stations, transmit data to the mobile stations, and to perform security functions and access control. The SGSN is connected to the base station subsystem 20, 30. A Gateway GSN (GGSN) 60 connects a GPRS network to 25 external networks, such as the Internet 90 or a X.25 network 80. The SGSN and GGSN functionalities may be combined in the same physical device, or they may be realized in different physical devices. Further, GPRS subscriber information is stored in home location registers (HLR) 45. The GSN nodes are interconnected using an IP protocol based packet data network 70.

When data packets intended for a mobile station arrive from an external network 80,90, they are first received by a GGSN 60, which routes the packets to the serving GSN 50 of the mobile station 10. If the GGSN 60 does have information about the SGSN of the MS, the GGSN can request location information of the MS from the 5 HLR 45. The SGSN forwards the packets to the MS 10 via the base station subsystem 20,30.

Three different classes of mobile stations will be supported. A class-A mobile station can simultaneously use both GPRS and circuit-switched services simultaneously. A class-B mobile station monitors control channels for GPRS and 10 other network services simultaneously, but can use only one type of service at one time, i.e. either packet connections or circuit switched connections. A class-C mobile station can only use GPRS services.

In the GPRS system, a PDP (Packet Data Protocol) context is set up, before a mobile station can transmit or receive information. A PDP context is associated with 15 the service provided by the GPRS system for a PDP address associated with a mobile station. A PDP address is an address for the MS according to the addressing scheme of an external network, to which the MS wishes to communicate. Further, a PDP context comprises entities in the MS, SGSN, and GGSN which control traffic associated with the PDP address. A PDP context comprises also further parameters 20 such as the negotiated quality of service (QoS) and other configuration parameters. Zero, one or more static i.e. permanent PDP addresses may be defined for a mobile station. Dynamic PDP addresses may also be defined for a mobile station. A dynamic PDP address is valid only for the particular connection, for which a dynamic address is defined.

25 The GPRS system is described in more detail in the specification GSM 03.60.

### B. The H.323 specification

Packet based networks are increasingly used for audio and video transmission as well. The H.323 specification has been created by the International Telecommunications Union (ITU) for the purpose of defining a standard framework 30 for audio, video and data communications over networks that do not provide a guaranteed quality of service (QoS). Examples of such networks are IP-based networks, such as corporate local area networks and the Internet. The aim of the

H.323 specification is to allow multimedia products and applications from different manufacturers to interoperate. The H.323 specification defines functionality for call control, multimedia management, and bandwidth management as well as interfacing between networks. The H.323 specification defines four major types of network

5 elements: terminals, gateways (GW), gatekeepers (GK), and multipoint control units (MCU). These will be shortly described in the following with reference to figure 1

A terminal 120,130 is a client device on the network, which typically provides real-time, two-way communication for the user. All H.323 terminals must support voice communications, and they also may support video and data communications. The

10 H.323 specification specifies various modes of operation required for different terminals to communicate together. A terminal can be realized using a personal computer 130, or the terminal may be a stand alone unit such as a telephone 120. Further examples of terminals are Internet telephones, audio conferencing terminals, and video conferencing terminals.

15 A gateway 100 is used to connect a H.323 network to other types of networks and/or terminal types. A gateway may for example translate transmission formats or protocols between the networks. A gateway can also participate in call setup procedures between the networks.

A gatekeeper 110 functions as a controlling unit for a given section of a H.323 network, i.e. a H.323 zone. A gatekeeper provides call control services to registered endpoints i.e. terminals. Further, a gatekeeper performs address translation between local area network aliases for terminals and gateways to IP addresses. A gatekeeper may also perform bandwidth management, i.e. transmission resource control. The gatekeeper can also be used to route H.323 calls, in which case the calls are under control of the gatekeeper, which allows a simple way of providing many different kinds of services and traffic management features. While the concept of a gatekeeper is logically separate from the concept of a gateway or a multipoint control unit (MCU), the gatekeeper can be realized in the same physical device as a gateway or a MCU.

25 A Multipoint Control Unit (MCU) 140 is a unit, which manages conference calls, i.e. connections having at least three participants. A multipoint control unit comprises a multipoint controller (MC), and it may also comprise multipoint

processors (MP). A MC handles connection management negotiations between the participants. Multipoint processors take care of the actual processing of the data streams, i.e. performs mixing, switching, and any other processing of the audio, video, and/or data streams. Functionality of a MCU can be implemented in a 5 dedicated network element, or the functionality can be realized in another H.323 component.

### **C. Some problems of the prior art**

Since the GPRS system is a system which provides packet data transmission, speech and video connections according to the H.323 specification can be established 10 through the GPRS system. However, the GPRS system is optimized for data transmission, not for real-time services such as speech or video transmission. Therefore performing voice transmission over a GPRS network for example according to H.323 protocols introduces problems. Voice transmission over the GPRS system occurs for example when the user of a H.323 voice terminal 120 wishes to call the mobile station 10, in which case the data packets of the speech signal are transmitted through the H.323 network 150, the Internet 90, and the GPRS system 60,70,50,30,20. One specific problem is how the GPRS system can identify, which packet data connection is a real time connection requiring a high connection quality, and which connections are normal data connections. If the 15 GPRS system is unable to correctly identify real time connections such as voice or video connections and provide a corresponding level of service instead of normal service awarded for data connections, the users will be disturbed by any eventual delays, which are acceptable and normal in data connections.

### **Summary of the invention**

25 An object of the invention is to provide a method for management of real time connections in a GPRS network. A further object of the invention is to provide a system, which is able to identify real time connections.

The objects are reached by arranging the GPRS system to monitor a transport layer 30 service access point (TSAP) such as a specific UDP (User Datagram Protocol) port, which is used for IP telephony call setup and release signaling.

The method according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim. The system according to the invention is characterized by that, which is specified in the characterizing part of the independent claim directed to a system. The network element according to the

5 invention is characterized by that, which is specified in the characterizing part of the independent claim directed to a network element. The mobile station according to the invention is characterized by that, which is specified in the characterizing part of the independent claim directed to a mobile station. The dependent claims describe further advantageous embodiments of the invention.

10 According to the invention, the GPRS system is arranged to monitor IP telephony call setup messages, which can be performed by monitoring a transport layer service access point (TSAP), which the IP telephony system uses for call setup signaling. Such a TSAP may be for example a specific UDP (User Datagram Protocol) or TCP (Transmission Control Protocol) port at the IP address corresponding to the mobile

15 station. The term TSAP identifier is used to refer to the particular port number or a corresponding identifier of a TSAP. The monitoring may be performed for example by the GPRS control entities in the mobile station, whereby the control entities are able to determine if the packet connection requires more transmission capacity due to the use of the connection for a real time service such as speech or video.

20 Thereafter the control entities are able to set up a PDP context having a corresponding level of service. Monitoring in the mobile station is advantageous in mobile originated IP telephony calls. The monitoring may as well be performed by a GSN, which is advantageous for mobile terminated IP telephony connections.

25 The invention can be used with any IP telephony protocol, such as the H.323 protocol and the SIP protocol. In the following description several examples are presented within the context of H.323 protocol. However, the invention is not limited to be used in connection with H.323 protocol only, since other IP telephony protocols such as the SIP protocol may as well be used.

**Brief description of the drawings**

30 The invention is described in more detail in the following with reference to the accompanying drawings, of which

figure 1 shows a GPRS system and a H.323 zone interconnected through the Internet according to prior art,

figure 2 illustrates a signaling sequence according to an advantageous embodiment of the invention,

5 figure 3 illustrates a second example of a signaling sequence according to a further advantageous embodiment of the invention,

figure 4 illustrates a third example of a signaling sequence according to an advantageous embodiment of the invention,

10 figure 5 illustrates a fourth example of a signaling sequence according to an advantageous embodiment of the invention,

figure 6 illustrates a flow chart of method according to an advantageous embodiment of the invention, and

figure 7 illustrates an example of a system according to an advantageous embodiment of the invention.

15 Same reference numerals are used for similar entities in the figures.

#### **Detailed description**

##### **1. A first advantageous embodiment of the invention**

In an advantageous embodiment of the invention, a well-known transport layer service access point (TSAP) identifier is used. A well-known TSAP identifier according to the H.323 specification is a TSAP identifier that has been allocated by an authority that is in charge of the assignment of TSAP identifiers for a particular networking protocol and the related transport protocols. For example, the port 1720 has been allocated for use as a TSAP in the UDP protocol. This means, that when the UDP protocol is used as the transport protocol in H.323 connections, connection 25 setup messages to a network element or a terminal are directed to the UDP port 1720 at the IP address of the network element or the terminal.

In this embodiment of the invention, the GPRS system can monitor the UDP port number 1720. Any observed H.323 call setup signals at the port consequently signify, that the corresponding call is a H.323 call, whereby the necessary capacity 30 for the service can be reserved, for example by creating a corresponding PDP context.

In the case that the originating terminal of the H.323 call is a GPRS mobile station, the unit performing the monitoring is the mobile station, more accurately a GPRS entity of the mobile station. When the GPRS entity observes H.323 call setup signaling messages directed to the UDP port 1720 at the destination, it then requests 5 the network to activate a PDP context according to the requirements of the call.

In the case that a GPRS terminal is the receiving terminal of a H.323 call, a network element such as a SGSN or a GGSN can monitor any arriving messages addressed to UDP port 1720 of the receiving terminal, and activate the setting up of a corresponding PDP context for the receiving terminal.

## 10 2. A second advantageous embodiment of the invention

According to the H.323 specification, a terminal may use a dynamically allocated port for call setup signaling. In such a case, the originating terminal requests a port identifier from the gatekeeper of its zone. The gatekeeper returns a port identifier identifying the port to be used at the receiving terminal, which port identifier the 15 originating terminal consequently uses for call setup signaling.

In an advantageous embodiment of the invention, a dynamically assigned TSAP is used for call setup signaling. Such an embodiment is feasible, when the gatekeeper functionality is integrated in a GPRS network element, such as a SGSN. In such an embodiment, the gatekeeper may set up the necessary PDP contexts as a response to 20 receiving a request for a dynamic TSAP identifier from a mobile station.

In a further advantageous embodiment of the invention, the GSN functioning as the gatekeeper begins monitoring call setup messages addressed to the assigned TSAP, after the SGSN has allocated a TSAP identifier and communicated the allocated identifier to the mobile station which has requested a TSAP identifier to be 25 allocated. When the SGSN observes call setup messages, it can set up corresponding PDP contexts for the call.

## 3. An example of a signaling sequence

Figure 2 illustrates a signaling sequence according to an advantageous embodiment 30 of the invention. Figure 2 illustrates signaling between a H.323 entity 10A in the mobile station 10, a GPRS entity 10B in the mobile station 10, a SGSN 50, a GGSN

60, and a remote H.323 terminal 120. The H.323 entity 10A in the mobile station 10 may be for example a speech conferencing program, which can create and use H.323 connections.

5 Signaling according to figure 2 may occur for example when the MS is in the idle state, or for example when the H.323 call will be activated using a PDP address corresponding to an inactive PDP context, i.e. another PDP context than that or those already active.

In this example, the GPRS entity 10B of the MS performs the monitoring for H.323 call setup signaling.

10 In the first step 205, the H.323 entity 10A in the mobile station 10 starts call setup signaling according to the H.323 protocol, and sends a PDU (protocol data unit) containing a call setup message. The PDU is first received by the GPRS entity 10B in the mobile station 10. The GPRS entity 10B observes, that the PDU is addressed to a TSAP in the external packet network, such as the UDP port 1720 at a an 15 address of the external network, and that the PDU contains a H.323 call setup message. The GPRS entity 10B can determine the characteristics of the H.323 call from the setup message, and start a PDP context activation sequence with corresponding parameters.

20 The PDP context activation sequence proceeds according to the GSM 03.60 specification as described in steps 210 to 230. The MS 10 sends 210 an ACTIVATE PDP CONTEXT REQUEST message to the SGSN, listing the desired context parameters as parameters of the message. In the next step 215, the MS and the SGSN may optionally exchange messages relating to security functions. In the next 25 step 220, the SGSN sends a CREATE PDP CONTEXT REQUEST message to the GGSN connecting the GPRS system to the external network. The GGSN responds by sending 225 a CREATE PDP CONTEXT RESPONSE message back to the SGSN. In the next step, the SGSN finishes the PDP context sequence by sending 230 an ACTIVATE PDP CONTEXT ACCEPT message to the MS, listing the parameters of the PDP context as parameters of the message. The PDP context activation sequence of steps 210 to 230 is described in further detail in section 30 9.2.2.1 of the GSM 03.60 specification version 6.2.0.

After receiving the ACCEPT message, the GPRS entity 10B of the MS can send 235 the PDU of the H.323 application to the remote H.323 terminal via the SGSN and GGSN. Thereafter, the H.323 entity 10A of the MS and the remote H.323 terminal 120 can continue normally call setup signaling and call data transfer.

5    4. Another example of a signaling sequence

Figure 3 illustrates a signaling sequence according to a further advantageous embodiment of the invention. Figure 3 illustrates signaling between a H.323 entity 10A in the mobile station 10, a GPRS entity 10B in the mobile station 10, a SGSN 50, a GGSN 60, and a remote H.323 terminal 120. The H.323 entity 10A in the 10 mobile station 10 may be for example a speech conferencing program, which can create and use H.323 connections.

Signaling according to figure 3 may occur for example when the MS already has an active PDP context, and the PDP address of the active PDP context will be used for a H.323 call.

15    In this example, the SGSN performs the monitoring of H.323 call setup signaling.

In the first step 305, the H.323 entity 10A in the mobile station 10 starts call setup signaling according to the H.323 protocol, and sends a PDU (protocol data unit) containing a call setup message. The PDU is first received by the GPRS entity 10B in the mobile station 10, which forwards 310 the PDU to the SGSN. The SGSN 50 observes, that the PDU is addressed to a TSAP in the external packet network, such as the UDP port 1720 at a an address of the external network, and that the PDU contains a H.323 call setup message. The SGSN 50 can determine the characteristics of the H.323 call from the setup message, and start a PDP context modification sequence to modify the active PDP context accordingly.

25    The PDP context modification sequence proceeds according to the GSM 03.60 specification as described in steps 315 to 330. In the next step 315, the SGSN 50 sends an UPDATE PDP CONTEXT REQUEST to the GGSN 60, to which the GGSN replies by sending 320 an UPDATE PDP CONTEXT RESPONSE message back to SGSN. Steps 315 and 320 are optional according to the GSM 03.60 specification and do not need to be always performed. Next, the SGSN sends 325 a MODIFY PDP CONTEXT REQUEST message to the MS listing the new

parameters of the PDP context as parameters of the message. The MS responds by sending 330 a MODIFY PDP CONTEXT ACCEPT message back to the SGSN. The PDP context modification sequence of steps 315 to 330 is described in further detail in section 9.2.3.1 of the GSM 03.60 specification version 6.2.0.

5 After the PDP context modification sequence is completed, the SGSN continues to send 335 further the PDU's from the MS via the GGSN to the remote H.323 terminal in the normal way.

In a further advantageous embodiment, the GPRS entity 10B of the MS performs the monitoring of data packets, and if a call setup message is detected, the GPRS 10 entity 10B sends a message to the SGSN. Preferably, the GPRS entity 10B attaches parameters from the call setup message as a parameter to the message it sends to the SGSN. After receiving the message, the SGSN can execute the PDP context modification sequence as described previously in steps 315 to 330, whereafter the MS can continue transmitting PDU's as before.

15 **5. A third example of a signaling sequence**

Figure 4 illustrates a signaling sequence according to a further advantageous embodiment of the invention. Figure 4 illustrates signaling between a H.323 entity 10A in the mobile station 10, a GPRS entity 10B in the mobile station 10, a SGSN 50, a GGSN 60, and a remote H.323 terminal 120. The H.323 entity 10A in the 20 mobile station 10 may be for example a speech conferencing program, which can create and use H.323 connections.

Signaling according to figure 4 may occur for example when a remote H.323 terminal sends call setup messages to a MS, and the PDP context for the corresponding PDP address of the MS is inactive.

25 In this example, the GGSN performs the monitoring of H.323 call setup signaling.

First, a remote H.323 terminal 120 sends 405 a call setup message in a PDU (protocol data unit) addressed to a TSAP at the PDP address of the MS. After receiving the PDU, the GGSN examines 406 the PDU and observes, that it is addressed to a TSAP and contains a call setup message. Next, the GGSN extracts 30 408 information from the call setup message concerning the nature of the call, for

example information about the necessary quality of service level. If the GGSN does not have any information about the location of the addressed MS, i.e. does not know which GSN is the serving GSN for the MS, the GGSN can at this stage request routing information from the HLR. For clarity, signaling between HLR and GGSN 5 is not illustrated in figure 4. In the next step 410, the GGSN sends 410 a PDU NOTIFICATION REQUEST message to the SGSN. Preferably, the GGSN attaches the previously extracted information as a parameter to the message to inform the SGSN about the necessary level of service for the call. The SGSN responds by sending 415 a PDU NOTIFICATION RESPONSE message to the GGSN. After 10 sending the message, the SGSN sends 420 a REQUEST PDP CONTEXT ACTIVATION message to the MS, which triggers a normal PDP context activation sequence as described in the following in steps 210 to 230.

The PDP context activation sequence proceeds according to the GSM 03.60 specification as described in steps 210 to 230. The MS 10 sends 210 an ACTIVATE 15 PDP CONTEXT REQUEST message to the SGSN, listing the desired context parameters as parameters of the message. In the next step 215, the MS and the SGSN may optionally exchange messages relating to security functions. In the next step 220, the SGSN sends a CREATE PDP CONTEXT REQUEST message to the GGSN connecting the GPRS system to the external network. The GGSN responds 20 by sending 225 a CREATE PDP CONTEXT RESPONSE message back to the SGSN. In the next step, the SGSN finishes the PDP context sequence by sending 230 an ACTIVATE PDP CONTEXT ACCEPT message to the MS, listing the parameters of the PDP context as parameters of the message. The PDP context activation sequence of steps 210 to 230 is described in further detail in section 25 9.2.2.1 of the GSM 03.60 specification version 6.2.0.

After the PDP context activation sequence is completed, the GGSN sends 425 the PDU received from the remote terminal to the SGSN, which forwards 430 it to the GPRS entity 10B of the MS, whereafter the PDU is given 435 to the H.323 entity 10A of the MS.

30 In another advantageous embodiment, the SGSN performs the monitoring. In this embodiment, the activation of a PDP context after the GPRS system receives a PDU from a remote H.323 terminal is performed according to prior art, for example as described in section 9.2.2.2.1 of the GSM 03.60 specification version 6.2.0. After

the PDP context is activated, the data packets start flowing via the SGSN. When the SGSN detects a call setup message in a data packet, the SGSN starts a PDP context modification procedure as described previously with reference to steps 315 to 330 of figure 3, or for example as described in section 9.2.3.1 of the GSM 03.60 specification version 6.2.0. This embodiment has the advantage, that the inventive functionality can be implemented completely in the SGSN, whereby no new signaling messages need to be defined.

#### 6. A fourth example of a signaling sequence

Figure 5 illustrates a signaling sequence according to a further advantageous embodiment of the invention. Figure 5 illustrates signaling between a H.323 entity 10A in the mobile station 10, a GPRS entity 10B in the mobile station 10, a SGSN 50, a GGSN 60, and a remote H.323 terminal 120. The H.323 entity 10A in the mobile station 10 may be for example a speech conferencing program, which can create and use H.323 connections.

15 Signaling according to figure 5 may occur for example when a remote H.323 terminal sends call setup messages to a MS, and the PDP context for the corresponding PDP address of the MS is already active.

In this example, the SGSN performs the monitoring of H.323 call setup signaling.

First, a remote H.323 terminal 120 sends 505 a call setup message in a PDU (protocol data unit) addressed to a TSAP at the PDP address of the MS. The GGSN forwards 510 the PDU to the SGSN. After receiving the PDU, the SGSN examines 511 the PDU and observes, that it is addressed to a TSAP and contains a call setup message. Next, the SGSN extracts 512 information from the call setup message concerning the nature of the call, for example information about the necessary 25 quality of service level. If the service level is not good enough for the call, the SGSN may initiate a PDP context modification sequence, which is the case described in figure 5. The modification sequence comprises steps 315 to 330, which are described in the following.

30 The PDP context modification sequence proceeds according to the GSM 03.60 specification as described in steps 315 to 330. In the next step 315, the SGSN 50 sends an UPDATE PDP CONTEXT REQUEST to the GGSN 60, to which the

GGSN replies by sending 320 an UPDATE PDP CONTEXT RESPONSE message back to SGSN. Steps 315 and 320 are optional according to the GSM 03.60 specification and do not need to be always performed. Next, the SGSN sends 325 a MODIFY PDP CONTEXT REQUEST message to the MS listing the new 5 parameters of the PDP context as parameters of the message. The MS responds by sending 330 a MODIFY PDP CONTEXT ACCEPT message back to the SGSN. The PDP context modification sequence of steps 315 to 330 is described in further detail in section 9.2.3.1 of the GSM 03.60 specification version 6.2.0.

After the PDP context modification sequence is completed, the SGSN sends 515 the 10 PDU containing the call setup message to the GPRS entity 10B of the MS, whereafter the PDU is given 520 to the H.323 entity 10A of the MS.

## 7. An example of a method

In the following, a method according to an advantageous embodiment of the invention is described with reference to figure 6. In this method, data packets 15 transmitted by the GPRS system are monitored in step 605 for detecting packets comprising connection setup messages. If such a data packet has not been detected in step 610, monitoring is continued at step 605. If a packet comprising a connection setup message is detected, information contained in the connection setup message is extracted from the message in step 615, and used in determining 620 at least one 20 parameter of a PDP context. The monitoring may preferably be performed by a serving GPRS support node, a gateway GPRS support node, or for example a GPRS mobile station. The parameter may for example be the maximum allowed delay, priority, or amount of transmission resources reserved for the PDP context. Preferably, said connection setup messages being monitored are H.323 connection 25 setup messages.

In the next step 625, it is checked if a PDP context for the connection is already active. If said PDP context is not active when the packet is detected, said PDP context is set up 630 at least in part according to said at least one parameter. If said PDP context is active when the packet is detected, said PDP context is modified 635 30 at least in part according to said at least one parameter.

## 8. An example of a system

Figure 7 illustrates an example of a system according to an advantageous embodiment of the invention. Figure 7 shows a part of a GPRS system, namely a

5 GGSN 60 connected to an external network 80,90 such as an X.25 network or the Internet, a SGSN 50, and the internal IP network 70 of the GPRS system. Figure 7 further shows a home location register 45 connected to the GPRS network 70, a base station controller (BSC) 30, two base stations 20, and a mobile station 10.

A system 700 according to the invention comprises means 710 for monitoring data

packets transmitted in the GPRS system, means 720 for detecting a call setup

10 message in a data packet, and means 730 for determining at least one connection parameter based on information in a detected call setup message.

Advantageously, the system further comprises means 740 for initiating the setting

up a PDP context at least partly based on said at least one connection parameter.

Further, the system advantageously also comprises means 750 for initiating the

15 modifying a PDP context at least partly based on said at least one connection parameter.

The system according to the invention may advantageously be implemented in a

single network element 50,60 of a GPRS system. The network element may

advantageously be a serving GPRS support node. Further, the system may also be

20 implemented in a gateway GPRS support node.

However, the invention is not limited to the system being in a single element, since

the various means for realizing the functionality of the system may also be realized

in more than one separate network elements.

According to one advantageous embodiment, a mobile station 10 comprises means

25 710 for monitoring data packets, means 720 for detecting a call setup message in a

data packet, and means 730 for determining at least one connection parameter based

on information in a detected call setup message.

Preferably the means 710,720,730,740,750 are realized using software programs stored in a memory element of a control unit of a network element or a mobile

communication means, the programs being executed by a microprocessor of the control unit.

### **9. Connection state change signaling**

5 The previous examples teach the use of the invention in connection with call setup signaling. However, the invention can also be used in connection with other types of call state change signaling such as call release signaling. In such an embodiment of the invention, if call release signaling is observed, a corresponding PDP context modification or release procedure is started.

10 In one example of such an embodiment of the invention, the GPRS system can for example monitor the UDP port number 1720. Any observed H.323 call release signals at the port consequently signify, that the resources for the corresponding call can be released for example by releasing the corresponding PDP context.

15 In a further advantageous embodiment of the invention, connection status signaling such as signaling associated with changing of parameters of the connections is monitored. For example, if the data transfer rate of a H.323 connection is changed during the connection, the GPRS system observes the associated signaling, interprets the signaling for obtaining an estimate of how much resources will be needed after the change, and changes at least one parameter of the corresponding PDP context accordingly.

20 In the following claims, the term connection status change message refers to call setup messages, call release messages, and messages which aim to change a property of the associated call.

The entity performing the monitoring for connection status change signaling such as call release signaling can advantageously be the SGSN associated with the call.

25 **10. Further considerations**

Although in the previous description, the inventive method has been explained using examples from the GPRS system, the invention is not limited to being used in the GPRS system, since the invention can also be used in other packet data radio systems, such as systems developed from a second generation GPRS system.

As described previously, the invention can be used with any IP telephony protocol, such as the H.323 protocol and the SIP protocol. In the previous description several examples are presented within the context of H.323 protocol. However, the invention is not limited to be used in connection with H.323 protocol only, since 5 other IP telephony protocols such as the SIP protocol may as well be used.

The name of a given functional entity, such as the base station controller, is often different in the context of different cellular telecommunication systems. For example, in the UMTS system the functional entity corresponding to a base station controller (BSC) is the radio network controller (RNC). Therefore, the particular 10 terminology used to denote various functional entities in this specification are only examples according to the GSM system, and do not limit the invention in any way. Further, the various command names recited in this specification are intended to be examples only, and the invention is not limited to using the command names recited in this specification.

15 In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention.

**Claims**

1. A method for managing connections in a packet data radio system, characterized in that data packets transmitted by the packet data radio system are monitored for detecting packets comprising connection state change messages, and if a packet comprising a connection state change message is detected, information contained in the connection state change message is used in determining at least one parameter of a packet data connection of the packet data radio system.
- 5 2. A method according to claim 1, characterized in that said connection state change messages being monitored are connection setup messages.
- 10 3. A method according to claim 1, characterized in that said connection state change messages being monitored are connection release messages.
4. A method according to claim 1, characterized in that said connection state change messages being monitored are H.323 connection state change messages.
- 15 5. A method according to claim 1, characterized in that said connection state change messages being monitored are connection state change messages according to the SIP protocol.
6. A method according to claim 1, characterized in that the packet data radio system is the GPRS system.
- 20 7. A method according to claim 1, characterized in that the method comprises steps, in which said packet data connection of the packet data radio system is set up at least in part according to said at least one parameter.
8. A method according to claim 1, characterized in that the method comprises steps, in which said packet data connection of the packet data radio system is modified at least in part according to said at least one parameter.
- 25 9. A method according to claim 6, characterized in that said monitoring is performed by a serving GPRS support node.
10. A method according to claim 6, characterized in that said monitoring is performed by a gateway GPRS support node.

11. A method according to claim 6, characterized in that said monitoring is performed by a GPRS mobile station.

12. A system for managing connections in a packet data radio system, characterized in that it comprises

5 means for monitoring data packets transmitted in the packet data radio system,  
means for detecting a call setup message in a data packet, and  
means for determining at least one connection parameter based on information in a detected call setup message.

13. A system according to claim 12, characterized in that the system further  
10 comprises means for initiating the setting up a packet data connection of the packet data radio system at least partly based on said at least one connection parameter.

14. A system according to claim 12, characterized in that the system further comprises means for initiating the modifying a packet data connection of the packet data radio system at least partly based on said at least one connection parameter.

15 15. A packet data radio system network element, characterized in that it comprises  
means for monitoring data packets transmitted by the network element,  
means for detecting a call setup message in a data packet, and  
means for determining at least one connection parameter based on information in a  
20 detected call setup message.

16. A packet data radio system network element according to claim 15, characterized in that it is a GPRS network element.

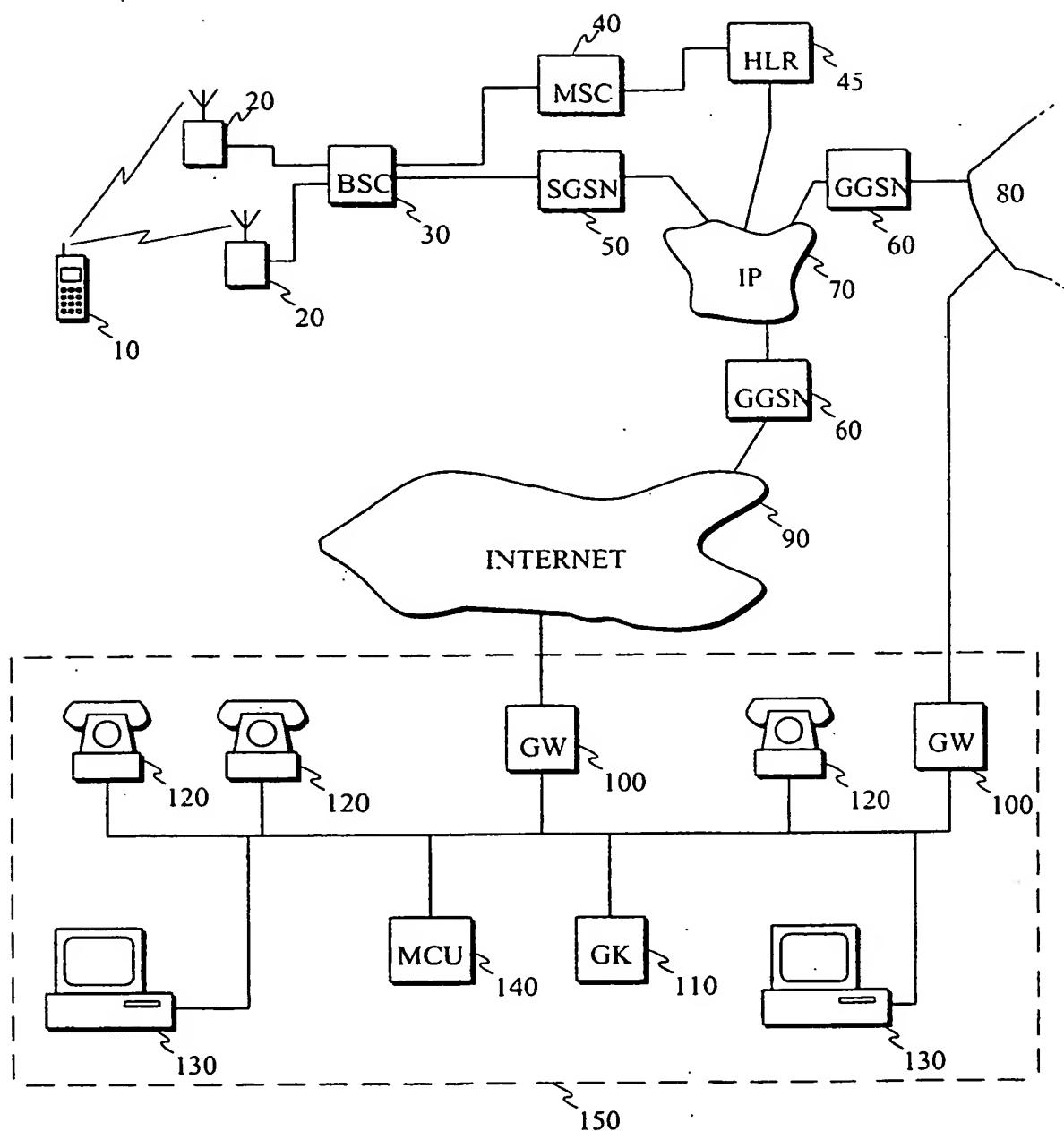
17. A packet data radio system network element according to claim 16, characterized in that the network element is a serving GPRS support node.

25 18. A packet data radio system network element according to claim 16, characterized in that the network element is a gateway GPRS support node.

19. A mobile station, characterized in that it comprises

means for monitoring data packets,  
means for detecting a call setup message in a data packet, and  
means for determining at least one connection parameter based on information in a  
30 detected call setup message.

1/6



**Fig. 1**  
PRIOR ART

2 / 6

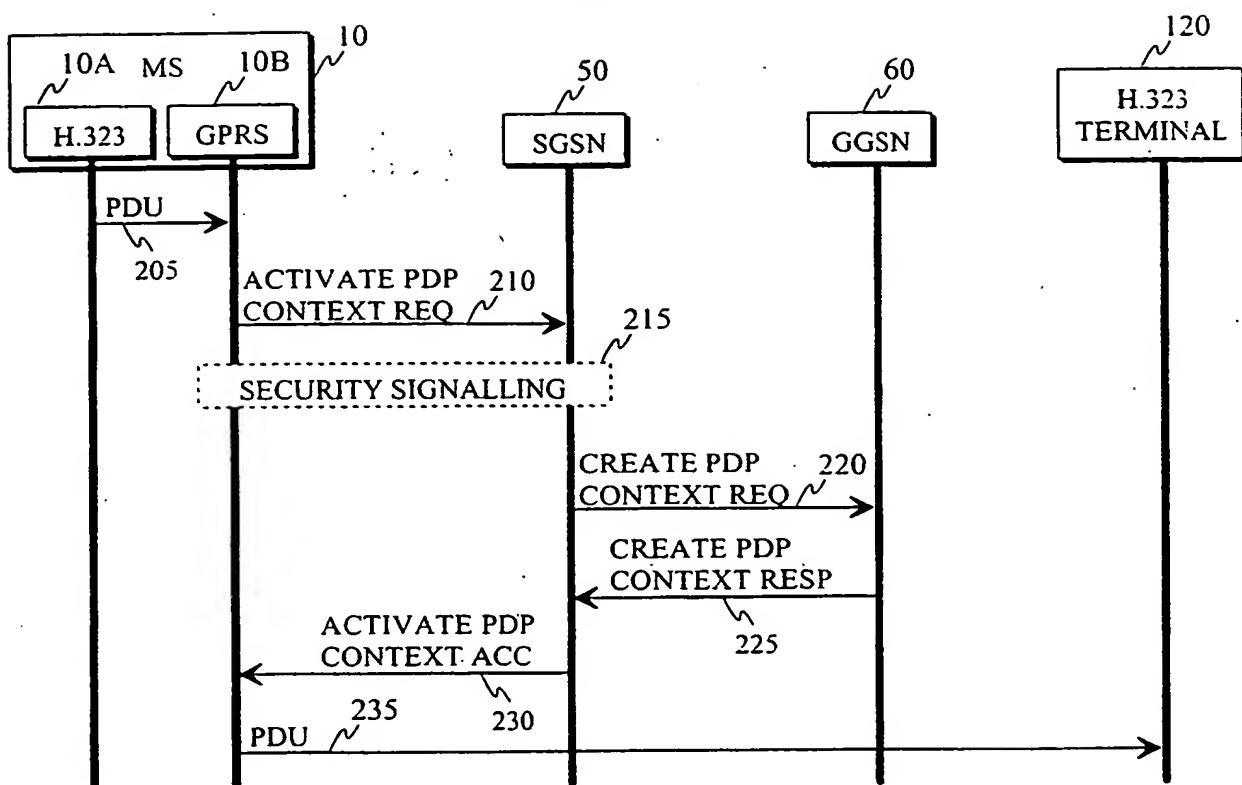


Fig. 2

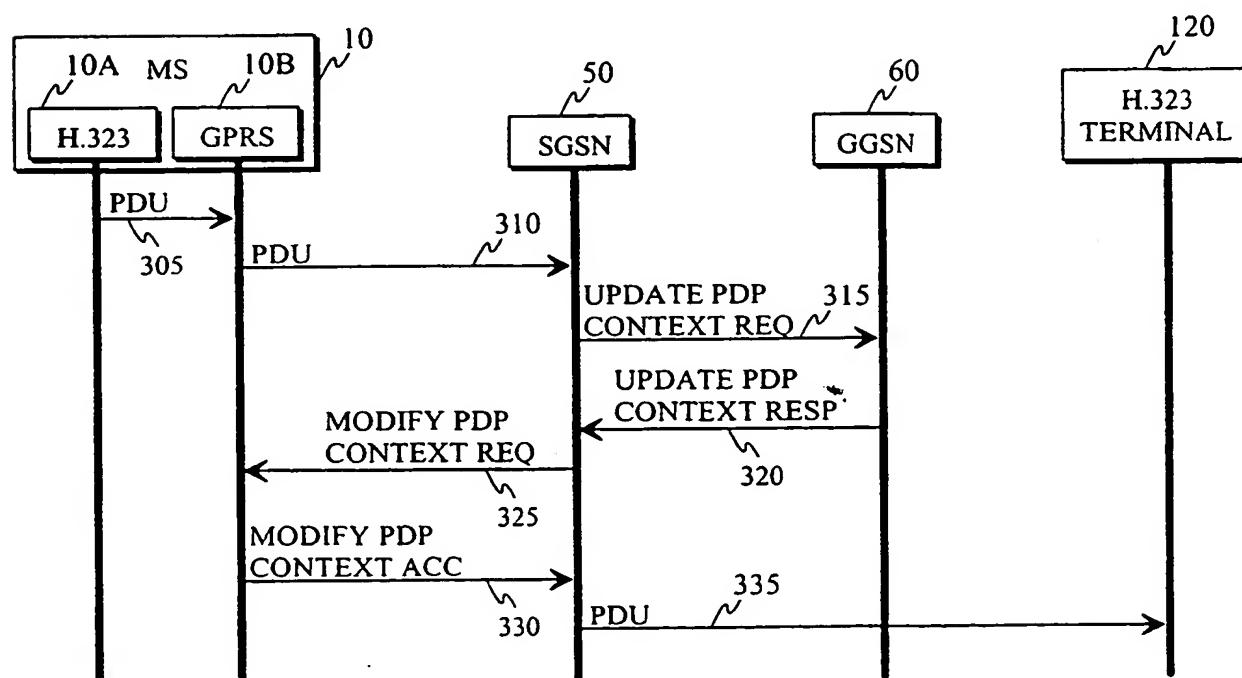


Fig. 3

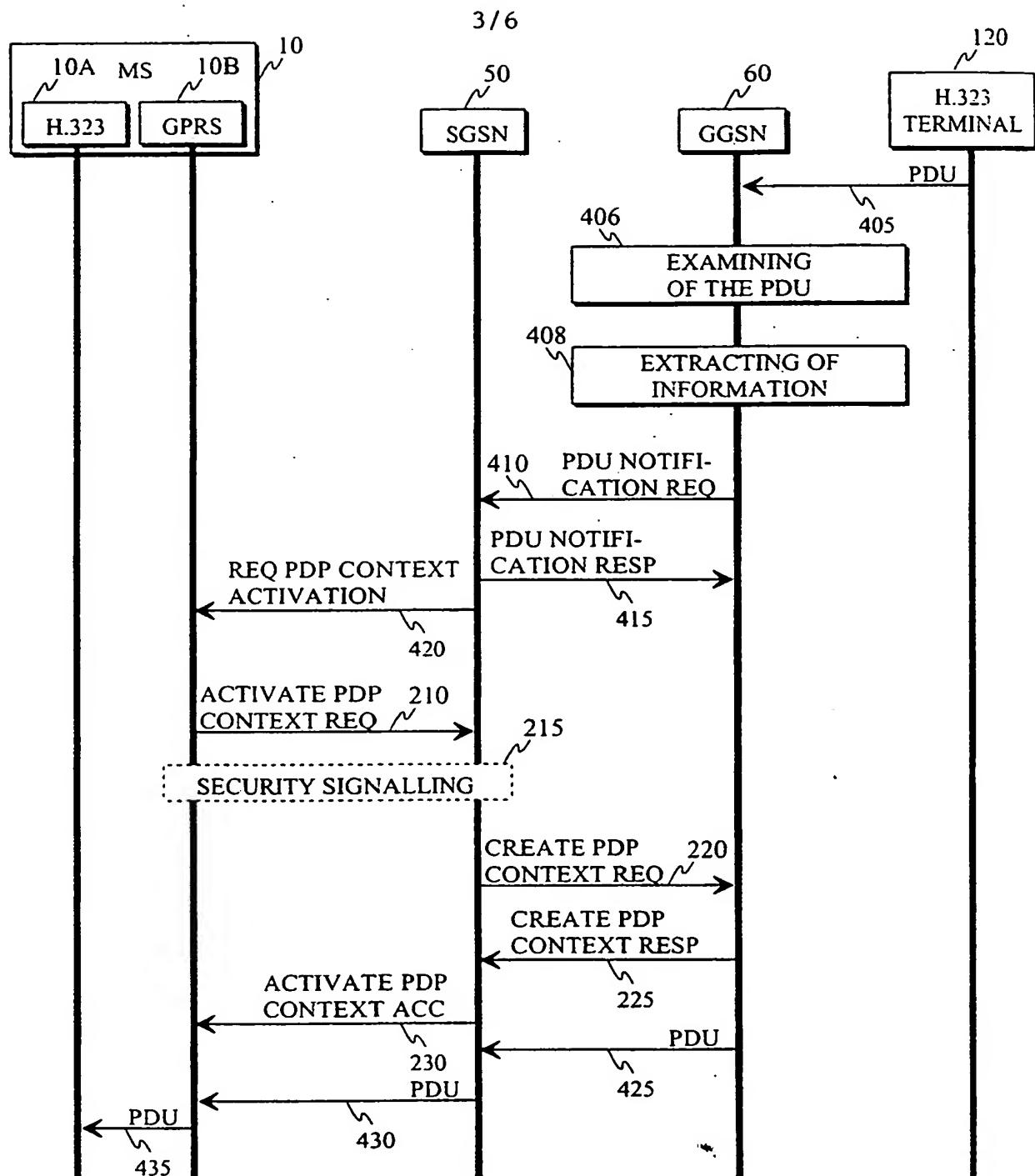


Fig. 4

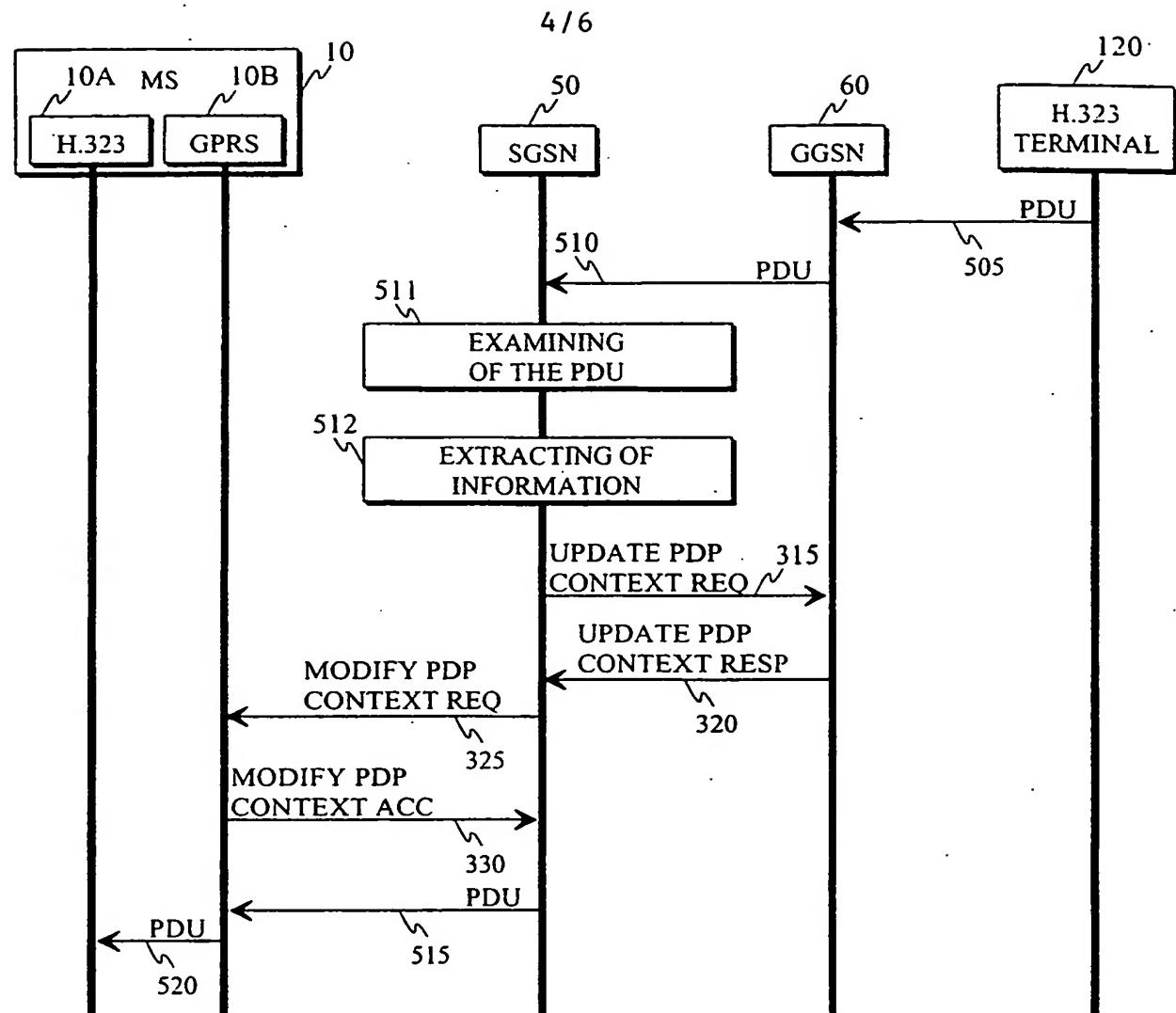


Fig. 5

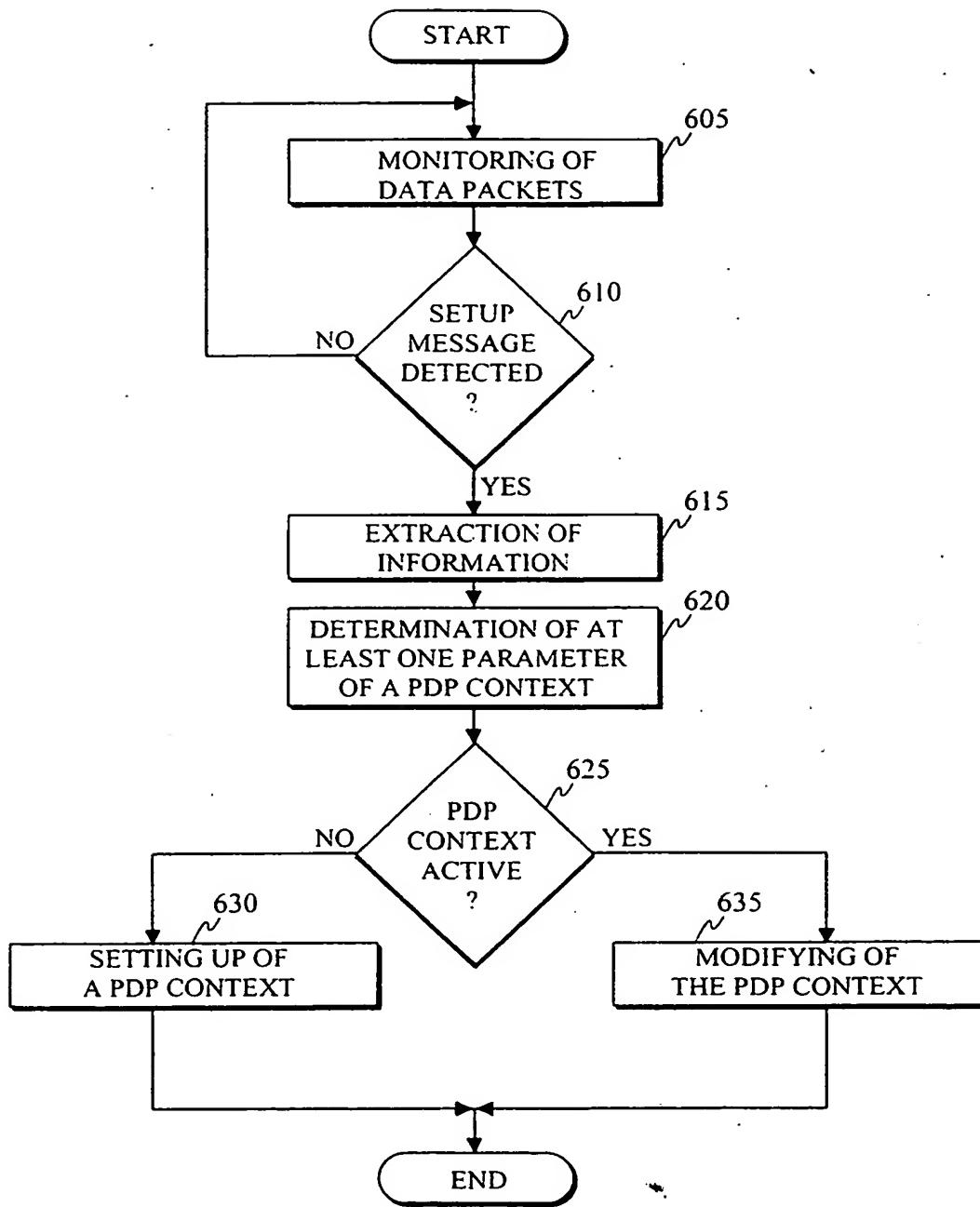
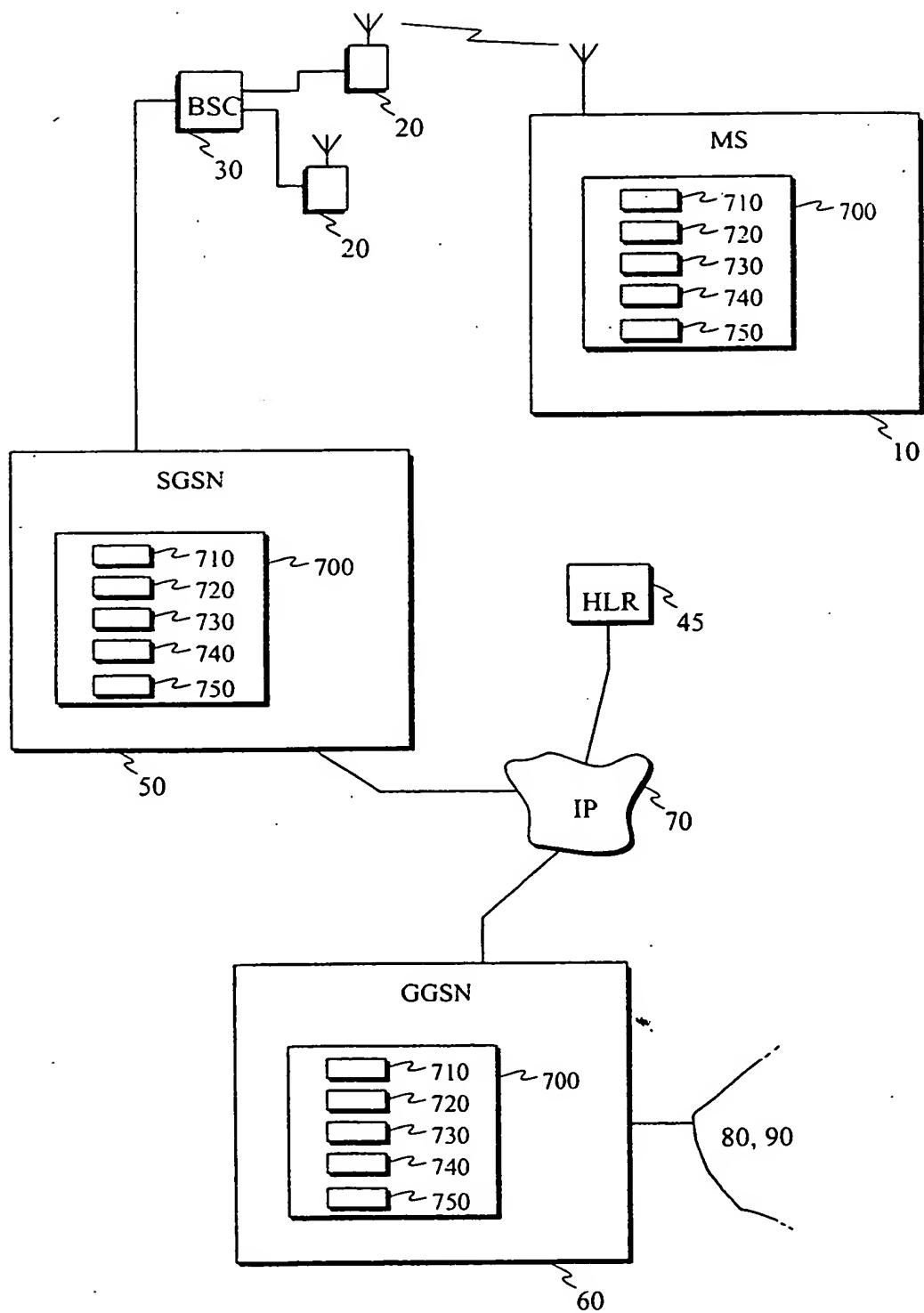


Fig. 6

**Fig. 7**

## PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE  
COMMUNICATION OF THE INTERNATIONAL  
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:  
 BERGGREN OY AB  
 P.O. Box 16  
 FIN-00101 Helsinki  
 FINLAND

*Berggren Oy Ab*

30-11-2000

Date of mailing (day/month/year) 23 November 2000 (23.11.00)			
Applicant's or agent's file reference 49771 /SKN/PKE		IMPORTANT NOTICE	
International application No. PCT/FI00/00428	International filing date (day/month/year) 12 May 2000 (12.05.00)	Priority date (day/month/year) 12 May 1999 (12.05.99)	
Applicant NOKIA NETWORKS OY et al			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
 AG,AU,DZ,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:  
 AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,  
 GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,  
 NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW  
 The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on  
 23 November 2000 (23.11.00) under No. WO 00/70825

## REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

## REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. (41-22) 740.14.35	Authorized officer  J. Zahra  Telephone No. (41-22) 338.83.38
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Continuation of Form PCT/IB/308

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF  
THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

Date of mailing (day/month/year) 23 November 2000 (23.11.00)	<b>IMPORTANT NOTICE</b>
Applicant's or agent's file reference 49771	International application No. PCT/FI00/00428
<p>The applicant is hereby notified that, at the time of establishment of this Notice, the time limit under Rule 46.1 for making amendments under Article 19 has not yet expired and the International Bureau had received neither such amendments nor a declaration that the applicant does not wish to make amendments.</p>	

## PATENTTI- JA REKISTERIHALLITUS

Patentti- ja innovaatiolinja Patent &amp; Innovation

## TUTKIMUSRAPORTTI

PATENTTIHAKEMUS  
NRO Appln. No.  
991093

LUOKITUS  
Classification  
H04L 12/56, H04Q 7/22

## TUTKITTU AINEISTO Research material

Patentijulkaisukokoelma (FI, SE, NO, DK, DE, CH, EP, WO, GB, US), tutkitut luokat  
Published patent specification researched classes  
H04L 12/56, H04Q 7/22

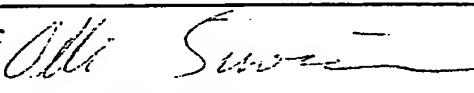
## Tiedonhaut ja muu aineisto Data search and other material

EPODOC, WPI

## VIITEJULKAISUT Reference publications

Kategoria*) Category	Julkaisun tunnistetiedot Identification data	Koskee vaatimuksia	Relevant to claims
A	WO-A-9916266, H04Q 7/22, Telefonaktiebolaget LM Ericsson	1,12,15,19	
A	FI-B-103005, H04Q 7/24, Nokia Telecommunications Oy	1,12,15,19	

\*) X Patentoitavuuden kannalta merkittävä julkaisu yksinään tarkasteltuna  
 Y Patentoitavuuden kannalta merkittävä julkaisu, kun otetaan huomioon tämä ja yksi tai useampi samaan kategoriaan kuuluva julkaisu  
 A Yleistä tekniikan tasoa edustava julkaisu, ei kuitenkaan patentoitavuuden este A) Technological background, not a novelty bar.

Päiväys Date 19.6.2000	Tutkija Examiner  Olli-Pekka Sievänen
---------------------------	--

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/EP

# PCT

## DEMAND

PCT Chapter II

MU DG 2

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA		Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference 49771/SKU/PKK
International application No. PCT/FI00/00428	International filing date (day/month/year) 12 May 2000 (12.05.00)	(Earliest) Priority date (day/month/year) 12 May 1999 (12.05.99)
Title of invention Connection management method		
Box No. II APPLICANT(S)		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) NOKIA NETWORKS OY P.O. Box 300, FIN-00045 NOKIA GROUP, Finland	Telephone No.:	
	Facsimile No.:	
	Teleprinter No.:	
State (that is, country) of nationality: Finland	State (that is, country) of residence: Finland	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) HUUSKO, Sami Tornitaso 3 As 33, FIN-02120 ESPOO, Finland		
State (that is, country) of nationality: Finland	State (that is, country) of residence: Finland	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)		
State (that is, country) of nationality:	State (that is, country) of residence:	
<input type="checkbox"/> Further applicants are indicated on a continuation sheet.		

## Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is  agent  common representative

and  has been appointed earlier and represents the applicant(s) also for international preliminary examination.

is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.

is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

BERGGREN OY AB  
P.O. Box 16, FIN-00101 HELSINKI, Finland

Telephone No.:

+358 9 693701

Facsimile No.:

+358 9 6933944

Teleprinter No.:

Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

## Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

## Statement concerning amendments:\*

1. The applicant wishes the international preliminary examination to start on the basis of:

the international application as originally filed

the description  as originally filed

as amended under Article 34

the claims  as originally filed

as amended under Article 19 (together with any accompanying statement)

as amended under Article 34

the drawings  as originally filed

as amended under Article 34

2.  The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3.  The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). (This check-box may be marked only where the time limit under Article 19 has not yet expired.)

\* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

## Language for the purposes of international preliminary examination: English

which is the language in which the international application was filed.

which is the language of a translation furnished for the purposes of international search.

which is the language of publication of the international application.

which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

## Box No. V ELECTION OF STATES

The applicant hereby elects all eligible States (that is, all States which have been designated and which are bound by Chapter II of the PCT)

excluding the following States which the applicant wishes not to elect:

## Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:			For International Preliminary Examining Authority use only	
			received	not received
1. translation of international application	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
2. amendments under Article 34	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
3. copy (or, where required, translation) of amendments under Article 19	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
4. copy (or, where required, translation) of statement under Article 19	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
5. letter	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
6. other (specify)	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>

The demand is also accompanied by the item(s) marked below:

1. <input checked="" type="checkbox"/> fee calculation sheet	4. <input type="checkbox"/> statement explaining lack of signature
2. <input type="checkbox"/> separate signed power of attorney	5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form
3. <input type="checkbox"/> copy of general power of attorney; reference number, if any:	6. <input type="checkbox"/> other (specify):

## Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

*Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).*

BERGGREN OY AB

Sirpa Kuisma  
Patent Agent

HELSINKI, Finland 7 December 2000

## For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:
2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
3.  The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply.  The applicant has been informed accordingly.
4.  The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
5.  Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

## For International Bureau use only

Demand received from IPEA on:

## FEE CALCULATION SHEET

## Annex to the Demand for international preliminary examination

International application No.	PCT/FI00/00428	For International Preliminary Examining Authority use only	
Applicant's or agent's file reference	49771/SKU/PKK	Date stamp of the IPEA	
<b>Applicant</b> NOKIA NETWORKS OY			
<b>Calculation of prescribed fees</b>			
1. Preliminary examination fee .....	EUR 1533	P	
2. Handling fee ( <i>Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.</i> ) .....	EUR 147	H	
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box.....	EUR 1680	TOTAL	
<b>Mode of Payment</b>			
<input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)	<input type="checkbox"/> cash		
<input type="checkbox"/> cheque	<input type="checkbox"/> revenue stamps		
<input type="checkbox"/> postal money order	<input type="checkbox"/> coupons		
<input type="checkbox"/> bank draft	<input checked="" type="checkbox"/> other ( <i>specify</i> ): Bank transfer to account 157230-340380		

Deposit Account Authorization (*this mode of payment may not be available at all IPEAs*)

The IPEA/ EP  is hereby authorized to charge the total fees indicated above to my deposit account.

(*this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit*) is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

Deposit Account Number	Date (day/month/year)	Signature
------------------------	-----------------------	-----------

## PCT REQUEST

Original (for SUBMISSION) - printed on 12.05.2000 08:57:04 AM

0	For receiving Office use only International Application No.	
0-1		
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4	Form - PCT/RO/101 PCT Request	
0-4-1	Prepared using <b>PCT-EASY Version 2.90 (updated 08.03.2000)</b>	
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant) <b>National Board of Patents and Registration (Finland) (RO/FI)</b>	
0-7	Applicant's or agent's file reference <b>49771</b>	
I	Title of invention <b>CONNECTION MANAGEMENT METHOD</b>	
II	Applicant	
II-1	This person is: <b>applicant only</b>	
II-2	Applicant for <b>all designated States except US</b>	
II-4	Name <b>NOKIA NETWORKS OY</b>	
II-5	Address: <b>P.O. Box 300 FIN-00045 Nokia Group Finland</b>	
II-6	State of nationality <b>FI</b>	
II-7	State of residence <b>FI</b>	
II-8	Telephone No. <b>+358-9-51121</b>	
II-9	Facsimile No. <b>+358-9-51168080</b>	
III-1	Applicant and/or inventor	
III-1-1	This person is: <b>applicant and inventor</b>	
III-1-2	Applicant for <b>US only</b>	
III-1-4	Name (LAST, First) <b>HUUSKO, Sami</b>	
III-1-5	Address: <b>Tornitaso 3 As 33 FIN-02120 Espoo Finland</b>	
III-1-6	State of nationality <b>FI</b>	
III-1-7	State of residence <b>FI</b>	

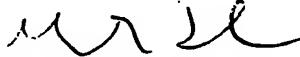
## PCT REQUEST

Original (for SUBMISSION) - printed on 12.05.2000 08:57:04 AM

IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: Name Address:	agent  BERGGREN OY AB P.O. Box 16 FIN-00101 Helsinki Finland +358-9-693701 +358-9-6933944 email.box@berggren.fi
V	<b>Designation of States</b>	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT  EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT  EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT  OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AG AL AM AT AU AZ BA BB BG BR BY CA CH&LI CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW

## PCT REQUEST

Original (for SUBMISSION) - printed on 12.05.2000 08:57:04 AM

V-5	<b>Precautionary Designation Statement</b> In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.		
V-6	<b>Exclusion(s) from precautionary designations</b> <b>NONE</b>		
VI-1	<b>Priority claim of earlier national application</b>		
VI-1-1	Filing date <b>12 May 1999 (12.05.1999)</b>		
VI-1-2	Number <b>991093</b>		
VI-1-3	Country <b>FI</b>		
VI-2	<b>Priority document request</b> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s): <b>VI-1</b>		
VII-1	<b>International Searching Authority Chosen</b> <b>Swedish Patent Office (ISA/SE)</b>		
VIII	Check list	number of sheets	electronic file(s) attached
VIII-1	Request	<b>4</b>	-
VIII-2	Description	<b>16</b>	-
VIII-3	Claims	<b>2</b>	-
VIII-4	Abstract	<b>1</b>	<b>49771.txt</b>
VIII-5	Drawings	<b>6</b>	-
VIII-7	TOTAL	<b>29</b>	
VIII-8	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-9	Fee calculation sheet	✓	-
VIII-10	Separate signed power of attorney	✓	-
VIII-16	Copy of general power of attorney	✓	-
VIII-16	PCT-EASY diskette	-	<b>diskette</b>
VIII-18	Figure of the drawings which should accompany the abstract	<b>3</b>	
VIII-19	Language of filing of the international application	<b>English</b>	
IX-1	Signature of applicant or agent		
IX-1-1	Name	<b>BERGGREN OY AB</b>	
IX-1-2	Name of signatory	<b>Markus Levlin</b>	
IX-1-3	Capacity	<b>Patent Agent</b>	

**PCT REQUEST**Original (for **SUBMISSION**) - printed on 12.05.2000 08:57:04 AM**FOR RECEIVING OFFICE USE ONLY**

10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	<b>ISA/SE</b>
10-6	Transmittal of search copy delayed until search fee is paid	

**FOR INTERNATIONAL BUREAU USE ONLY**

11-1	Date of receipt of the record copy by the International Bureau	
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## PCT (ANNEX - FEE CALCULATION SHEET)

Original (for SUBMISSION) - printed on 12.05.2000 08:57:04 AM

49771

(This sheet is not part of and does not count as a sheet of the international application)

0	For receiving Office use only		
0-1	International Application No.		
0-2	Date stamp of the receiving Office		
0-4	Form - PCT/RO/101 (Annex) PCT Fee Calculation Sheet		
0-4-1	Prepared using	PCT-EASY Version 2.90 (updated 08.03.2000)	
0-9	Applicant's or agent's file reference	49771	
2	Applicant	NOKIA NETWORKS OY, et al.	
12	Calculation of prescribed fees	fee amount/multiplier	total amounts (FIM)
12-1	Transmittal fee	T	800
12-2	Search fee	S	5 618
12-3	International fee Basic fee (first 30 sheets)	b1	2 431,8
12-4	Remaining sheets		0
12-5	Additional amount	(X)	53,51
12-6	Total additional amount	b2	0
12-7	b1 + b2 =	B	2 431,8
12-8	Designation fees Number of designations contained in international application		85
12-9	Number of designation fees payable (maximum 8)		8
12-10	Amount of designation fee	(X)	523,22
12-11	Total designation fees	D	4 185,76
12-12	PCT-EASY fee reduction	R	-749,16
12-13	Total International fee (B+D-R)	I	5 868,4
12-14	Fee for priority document Number of priority documents requested		1
12-15	Fee per document	(X)	422
12-16	Total priority document fee	P	422
12-17	TOTAL FEES PAYABLE (T+S+I+P)		12 708,4
12-19	Mode of payment	cheque	

## VALIDATION LOG AND REMARKS

13-2-6	Validation messages Contents	Green? Reference number for attached copy of general power of attorney not indicated.
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## PCT (ANNEX - FEE CALCULATION SHEET)

49771

Original (for SUBMISSION) - printed on 12.05.2000 08:57:04 AM

13-2-7	Validation messages Fees	Green? Please verify that modified fee amounts are correct.
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Original (for **SUBMISSION**) - printed on 12.05.2000 08:57:04 AM

**PCT-EASY INFORMATION SHEET**

(For applicant use only, DO NOT submit this sheet with the international application)

**VALIDATION LOG**

Green?	Contents
	Reference number for attached copy of general power of attorney not indicated.
	<b>Fees</b> Please verify that modified fee amounts are correct.

Before submitting the International Application, please carefully verify that:

- the information contained on printed Request form is correct;
- Box IX of the Request form has been signed;
- all elements of the international application as indicated in Box VIII of the Request form have been attached; and,
- the diskette containing the PCT-EASY zip file of the International Application has been enclosed and has been clearly labeled "PCT-EASY", with the applicant's or agent's file reference, and the first applicant's name.

**ATTENTION**

DO NOT modify any indications on the Request form printout. The attached PCT-EASY application has been locked. If an error or an omission is discovered at this time, you must copy the submitted application as a template and make the change or correction in a new application (using the submitted application as a template). You may create such a template by copying the submitted application from the "Stored Forms" folder to the "New PCT Forms" folder. Open the new (.WO) file created in the "New PCT Forms" folder, correct the errors and proceed with the submission process again.

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>49771</b>	<b>FOR FURTHER ACTION</b>	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. <b>PCT/FI 00/00428</b>	International filing date ( <i>day/month/year</i> ) <b>12 May 2000</b>	(Earliest) Priority Date ( <i>day/month/year</i> ) <b>12 May 1999</b>
<b>Applicant</b> <b>Nokia Network OY et al</b>		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1.  Certain claims were found unsearchable (See Box I).
2.  Unity of invention is lacking (See Box II).
3.  The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing
  - filed with the international application.
  - furnished by the applicant separately from the international application,
    - but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
    - transcribed by this Authority.
4. With regard to the title,  the text is approved as submitted by the applicant.
  - the text has been established by this Authority to read as follows:
5. With regard to the abstract,
  - the text is approved as submitted by the applicant.
  - the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is:
  - Figure No. 3 as suggested by the applicant.
  - because the applicant failed to suggest a figure.
  - because this figure better characterizes the invention.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00428

## A. CLASSIFICATION OF SUBJECT MATTER

**IPC7: H04L 12/00**

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

**IPC7: H04L**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

**SE,DK,FI,NO classes as above**

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0650286 A2 (MULTI-TECH SYSTEMS INC), 26 April 1995 (26.04.95), page 2, line 25 - line 58 --	1-3,6-19
A	EP 0758175 A1 (NTT MOBILE COMMUNICATIONS NETWORK INC.), 12 February 1997 (12.02.97), abstract --	1-19
A	EP 0766490 A2 (NOKIA MOBILE PHONES LTD.), 2 February 1997 (02.02.97), abstract --	1-19
P,A	WO 9933250 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 1 July 1999 (01.07.99), abstract --	1-19

 Further documents are listed in the continuation of Box C. See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

18 October 2000

24-10-2000

Name and mailing address of the ISA/  
Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. + 46 8 666 02 86Authorized officer  
Stefan Hansson/mj  
Telephone No. + 46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

Information on patent family members

03/10/00

International application No.

PCT/FI 00/00428

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP 0650286 A2	26/04/95	CA	2126928 A,C	26/04/95
		JP	2790977 B	27/08/98
		JP	7183973 A	21/07/95
		US	5453986 A	26/09/95
		US	5535204 A	09/07/96
		US	5617423 A	01/04/97
		US	5619508 A	08/04/97
		US	5764628 A	09/06/98
		US	5815503 A	29/09/98
		US	5864560 A	26/01/99
EP 0758175 A1	12/02/97	US	5974044 A	26/10/99
		WO	9621308 A	11/07/96
EP 0766490 A2	02/02/97	FI	954639 A	30/03/97
		JP	9130405 A	16/05/97
		US	5956331 A	21/09/99
WO 9933250 A1	01/07/99	AU	2081299 A	12/07/99

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 49771/SKU/PKK	<b>FOR FURTHER ACTION</b>		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/FI00/00428	International filing date (day/month/year) 12/05/2000	Priority date (day/month/year) 12/05/1999	
International Patent Classification (IPC) or national classification and IPC H04L12/00			
Applicant NOKIA NETWORKS OY et al.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

- I  Basis of the report
- II  Priority
- III  Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV  Lack of unity of invention
- V  Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI  Certain documents cited
- VII  Certain defects in the international application
- VIII  Certain observations on the international application

Date of submission of the demand 07/12/2000	Date of completion of this report 03.07.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Keller, M Telephone No. +49 89 2399 8807



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/FI00/00428

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1,3,4,6-15	as originally filed	
2,5,16	with telefax of	18/06/2001

**Claims, No.:**

1-19	with telefax of	18/06/2001
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**Drawings, sheets:**

1/6-6/6	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/FI00/00428

the description,      pages:  
 the claims,      Nos.:  
 the drawings,      sheets:

5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-19
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-19
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-19
	No:	Claims	

**2. Citations and explanations  
see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
see separate sheet

INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET

International application No. PCT/FI00/00428

With respect to SECTION V:

1. The present international application PCT/FI00/00428 relates, according to the title, to a connection management method.
2. Claim 1 claims a method for managing connections in a packet data radio system, independent Claim 12 claims a (corresponding) system, independent Claim 15 claims a network element of a packet data radio system, and independent Claim 19 claims a mobile station.
3. The available nearest prior art is represented by the document D1 = EP-A-0 650 286 .
4. The problems to be solved by the present international application are mainly explained on page 2 (line 27) to page 2 (line 6) and on page 4 (lines 7-23).  
*Some problems of the prior art:*  
*Since the General Packet Radio Service, GPRS, system is a system which provides packet data transmission, speech and video connections according to the H. 323 specification can be established through the GPRS system. However, the GPRS system is optimized for data transmission, not for real-time services such as speech or video transmission.*  
*Therefore performing voice transmission over a GPRS network for example according to H. 323 protocols introduces problems. Voice transmission over the GPRS system occurs for example when the user of a H. 323 voice terminal 120 wishes to call the mobile station 10, in which case the data packets of the speech signal are transmitted through the H. 323 network 150, the Internet 90, and the GPRS system 60,70,50,30,20. One specific problem is how the GPRS system can identify, which packet data connection is a real time connection requiring a high connection quality, and which connections are normal data connections. If the GPRS system is unable to correctly identify real time connections such as voice or video connections and provide a corresponding level of service instead of normal service awarded for data connections, the users will be disturbed by any eventual delays, which are acceptable and normal in data connections.*

5. Therefore the main objective of the invention (cf. page 4, penultimate paragraph) is to provide a method for management of real time connections in a GPRS network.

A further object of the invention is to provide a system, which is able to identify real time connections.

The objects are reached (cf. page 4 last paragraph) *"by arranging the GPRS system to monitor a transport layer service access point (TSAP) such as a specific UDP (User Datagram Protocol) port, which is used for IP telephony call setup and release signaling."*

Further explanations with respect to the inventive concept are given on page 5 (second paragraph) and on pages 6 and 7 ("A first / second advantageous embodiment of the invention").

6a. The problems are solved and the advantages are achieved with respect to Claim 1 by a method for managing connections in a packet data radio system, *characterized in that*

- at least data packets **relating to a predetermined allocated transport layer service access point (TSAP)** and transmitted by the packet data radio system are monitored (605) for detecting packets comprising connection state change messages,
- and if a packet comprising a connection state change message is detected, information contained in the connection state change message is used in determining (620) at least one parameter of a packet data connection of the packet data radio system.

6b. The problems are solved and the advantages are achieved with respect to independent Claim 12 by a system for managing connections in a packet data radio system, *characterized in that*

INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET

International application No. PCT/FI00/00428

it comprises

- means for monitoring at least data packets **relating to a predetermined allocated transport layer service access point (TSAP)** and transmitted in the packet data radio system,
- means for detecting a call setup message in a monitored data packet, and
- means for determining at least one connection parameter based on information in a detected call setup message.

6c. The problems are solved and the advantages are achieved with respect to independent Claim 15 by

a network element of a packet data radio system,

*characterized in that*

it comprises

- means for monitoring at least data packets **relating to a predetermined allocated transport layer service access point (TSAP)** and transmitted by the network element,
- means for detecting a call setup message in a monitored data packet, and
- means for determining at least one connection parameter based on information in a detected call setup message.

6d. The problems are solved and the advantages are achieved with respect to independent Claim 19 by

a mobile station,

*characterized in that*

it comprises

- means for monitoring at least data packets **relating to a predetermined allocated transport layer service access point (TSAP)** and ,
- means for detecting a call setup message in a monitored data packet, and
- means for determining at least one connection parameter based on information in a detected call setup message.

7. Neither the above-mentioned document nor the additionally cited documents of the search report disclose or suggest such features. Thus, the subject-matter defined in the above-mentioned independent claims is considered to be novel and to involve an inventive step (Articles 33 (2) and (3) PCT).

8. Dependent Claims 2 to 11, 13, 14 and 16 to 18 relate to further details of the method, the system or the network element respectively and are therefore equally novel and inventive (Art. 33 (2) and (3) PCT).
9. Industrial applicability (Article 33 (4) PCT) of the subject-matter claimed is beyond doubt.

**With respect to SECTION VII:**

- 1). Reference signs in parentheses should be inserted in the claims to increase their intelligibility, Rule 6.2 (b) PCT. This applies to both the preamble and the characterising portion.
- 2). Document **D1** (EP-A-0 650 286 ) mentioned in the international search report has not been identified in the description nor has the relevant background art disclosed therein been briefly discussed. Thus, the requirements of Rule 5.1 (a) (ii) PCT are not fulfilled.
- 3). On page 16, last paragraph, the closing statement is obviously unnecessary and therefore should be excised from the application (Rule 9.1 (iv) PCT; see also PCT Guidelines chapter III, 4.3a).

When data packets intended for a mobile station arrive from an external network 80,90, they are first received by a GGSN 60, which routes the packets to the serving GSN 50 of the mobile station 10. If the GGSN 60 does not have information about the SGSN of the MS, the GGSN can request location information of the MS from 5 the HLR 45. The SGSN forwards the packets to the MS 10 via the base station subsystem 20,30.

Three different classes of mobile stations will be supported. A class-A mobile station can simultaneously use both GPRS and circuit-switched services simultaneously. A class-B mobile station monitors control channels for GPRS and 10 other network services simultaneously, but can use only one type of service at one time, i.e. either packet connections or circuit switched connections. A class-C mobile station can only use GPRS services.

In the GPRS system, a PDP (Packet Data Protocol) context is set up, before a mobile station can transmit or receive information. A PDP context is associated with 15 the service provided by the GPRS system for a PDP address associated with a mobile station. A PDP address is an address for the MS according to the addressing scheme of an external network, to which the MS wishes to communicate. Further, a PDP context comprises entities in the MS, SGSN, and GGSN which control traffic associated with the PDP address. A PDP context comprises also further parameters 20 such as the negotiated quality of service (QoS) and other configuration parameters. Zero, one or more static i.e. permanent PDP addresses may be defined for a mobile station. Dynamic PDP addresses may also be defined for a mobile station. A dynamic PDP address is valid only for the particular connection, for which a dynamic address is defined.

25 The GPRS system is described in more detail in the specification GSM 03.60.

### **B. The H.323 specification**

Packet based networks are increasingly used for audio and video transmission as well. The H.323 specification has been created by the International Telecommunications Union (ITU) for the purpose of defining a standard framework 30 for audio, video and data communications over networks that do not provide a guaranteed quality of service (QoS). Examples of such networks are IP-based networks, such as corporate local area networks and the Internet. The aim of the

The method according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim. The system according to the invention is characterized by that, which is specified in the characterizing part of the independent claim directed to a system. The network element according to the invention is characterized by that, which is specified in the characterizing part of the independent claim directed to a network element. The mobile station according to the invention is characterized by that, which is specified in the characterizing part of the independent claim directed to a mobile station. The dependent claims describe further advantageous embodiments of the invention.

5 10 According to the invention, the GPRS system is arranged to monitor IP telephony call setup messages, which can be performed by monitoring a transport layer service access point (TSAP), which the IP telephony system uses for call setup signaling. Such a TSAP may be for example a specific UDP (User Datagram Protocol) or TCP (Transmission Control Protocol) port at the IP address corresponding to the mobile station. The term TSAP identifier is used to refer to the particular port number or a corresponding identifier of a TSAP. The monitoring may be performed for example by the GPRS control entities in the mobile station, whereby the control entities are able to determine if the packet connection requires more transmission capacity due to the use of the connection for a real time service such as speech or video.

15 20 Thereafter the control entities are able to set up a PDP context having a corresponding level of service. Monitoring in the mobile station is advantageous in mobile originated IP telephony calls. The monitoring may as well be performed by a GSN, which is advantageous for mobile terminated IP telephony connections.

25 The invention can be used with any IP telephony protocol, such as the H.323 protocol and the SIP (Session Initiation Protocol) protocol. In the following description several examples are presented within the context of H.323 protocol. However, the invention is not limited to be used in connection with H.323 protocol only, since other IP telephony protocols such as the SIP protocol may as well be used.

30 **Brief description of the drawings**

The invention is described in more detail in the following with reference to the accompanying drawings, of which

As described previously, the invention can be used with any IP telephony protocol, such as the H.323 protocol and the SIP protocol. In the previous description several examples are presented within the context of H.323 protocol. However, the invention is not limited to be used in connection with H.323 protocol only, since other IP telephony protocols such as the SIP protocol may as well be used.

5 The name of a given functional entity, such as the base station controller, is often different in the context of different cellular telecommunication systems. For example, in the UMTS system the functional entity corresponding to a base station controller (BSC) is the radio network controller (RNC). Therefore, the particular 10 terminology used to denote various functional entities in this specification are only examples according to the GSM system, and do not limit the invention in any way. Further, the various command names recited in this specification are intended to be examples only, and the invention is not limited to using the command names recited in this specification.

15 In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention as defined by the appended 20 claims.

**Claims**

1. A method for managing connections in a packet data radio system, characterized in that
  - at least data packets relating to a predetermined allocated transport layer service access point and transmitted by the packet data radio system are monitored (605) for detecting packets comprising connection state change messages;
  - and if a packet comprising a connection state change message is detected, information contained in the connection state change message is used in determining (620) at least one parameter of a packet data connection of the packet data radio system.
2. A method according to claim 1, characterized in that said connection state change messages being monitored are connection setup messages.
3. A method according to claim 1, characterized in that said connection state change messages being monitored are connection release messages.
4. A method according to claim 1, characterized in that said connection state change messages being monitored are H.323 connection state change messages.
5. A method according to claim 1, characterized in that said connection state change messages being monitored are connection state change messages according to the Session Initiation Protocol.
6. A method according to claim 1, characterized in that the packet data radio system is the General Packet Radio Service system.
7. A method according to claim 1, characterized in that the method comprises steps, in which said packet data connection of the packet data radio system is set up (630) at least in part according to said at least one parameter.
8. A method according to claim 1, characterized in that the method comprises steps, in which said packet data connection of the packet data radio system is modified (635) at least in part according to said at least one parameter.
9. A method according to claim 6, characterized in that said monitoring is performed by a serving GPRS support node.

10. A method according to claim 6, characterized in that said monitoring is performed by a gateway GPRS support node.
11. A method according to claim 6, characterized in that said monitoring is performed by a GPRS mobile station.
- 5 12. A system for managing connections in a packet data radio system, characterized in that it comprises means for monitoring at least data packets relating to a predetermined allocated transport layer service access point and transmitted in the packet data radio system, means for detecting a call setup message in a monitored data packet, and
- 10 means for determining at least one connection parameter based on information in a detected call setup message.
13. A system according to claim 12, characterized in that the system further comprises means for initiating the setting up a packet data connection of the packet data radio system at least partly based on said at least one connection parameter.
- 15 14. A system according to claim 12, characterized in that the system further comprises means for initiating the modifying a packet data connection of the packet data radio system at least partly based on said at least one connection parameter.
15. A network element of a packet data radio system, characterized in that it comprises
- 20 means for monitoring at least data packets relating to a predetermined allocated transport layer service access point and transmitted by the network element, means for detecting a call setup message in a monitored data packet, and means for determining at least one connection parameter based on information in a detected call setup message.
- 25 16. A network element of a packet data radio system according to claim 15, characterized in that it is a GPRS network element.
17. A network element of a packet data radio system according to claim 16, characterized in that the network element is a serving GPRS support node.
- 30 18. A network element of a packet data radio system according to claim 16, characterized in that the network element is a gateway GPRS support node.

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19. A mobile station, characterized in that it comprises  
means for monitoring at least data packets relating to a predetermined allocated  
transport layer service access point,  
means for detecting a call setup message in a monitored data packet, and  
5 means for determining at least one connection parameter based on information in a  
detected call setup message.

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 05 JUL 2001  
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Applicant's or agent's file reference  49771/SKU/PKK	<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No.  PCT/FI00/00428	International filing date (day/month/year)  12/05/2000	Priority date (day/month/year)  12/05/1999
International Patent Classification (IPC) or national classification and IPC  H04L12/00		
Applicant  NOKIA NETWORKS OY et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 6 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application</p>		

Date of submission of the demand  07/12/2000	Date of completion of this report  03.07.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Keller, M  Telephone No. +49 89 2399 8807



INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

International application No. PCT/FI00/00428

I. Basis of the report

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1,3,4,6-15	as originally filed	
2,5,16	with telefax of	18/06/2001

**Claims, No.:**

1-19	with telefax of	18/06/2001
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**Drawings, sheets:**

1/6-6/6	as originally filed
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2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY  
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International application No. PCT/FI00/00428

the description,      pages:

the claims,      Nos.:

the drawings,      sheets:

5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)): *(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:      Claims 1-19
	No:      Claims
Inventive step (IS)	Yes:      Claims 1-19
	No:      Claims
Industrial applicability (IA)	Yes:      Claims 1-19
	No:      Claims

**2. Citations and explanations  
see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
see separate sheet

With respect to SECTION V:

1. The present international application PCT/FI00/00428 relates, according to the title, to a connection management method.
2. Claim 1 claims a method for managing connections in a packet data radio system, independent Claim 12 claims a (corresponding) system, independent Claim 15 claims a network element of a packet data radio system, and independent Claim 19 claims a mobile station.
3. The available nearest prior art is represented by the document  
D1 = EP-A-0 650 286 .
4. The problems to be solved by the present international application are mainly explained on page 2 (line 27) to page 2 (line 6) and on page 4 (lines 7-23).  
*Some problems of the prior art:*  
*Since the General Packet Radio Service, GPRS, system is a system which provides packet data transmission, speech and video connections according to the H. 323 specification can be established through the GPRS system. However, the GPRS system is optimized for data transmission, not for real-time services such as speech or video transmission.*  
*Therefore performing voice transmission over a GPRS network for example according to H. 323 protocols introduces problems. Voice transmission over the GPRS system occurs for example when the user of a H. 323 voice terminal 120 wishes to call the mobile station 10, in which case the data packets of the speech signal are transmitted through the H. 323 network 150, the Internet 90, and the GPRS system 60,70,50,30,20. One specific problem is how the GPRS system can identify, which packet data connection is a real time connection requiring a high connection quality, and which connections are normal data connections. If the GPRS system is unable to correctly identify real time connections such as voice or video connections and provide a corresponding level of service instead of normal service awarded for data connections, the users will be disturbed by any eventual delays, which are acceptable and normal in data connections.*

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5. Therefore the main objective of the invention (cf. page 4, penultimate paragraph) is to provide a method for management of real time connections in a GPRS network.

A further object of the invention is to provide a system, which is able to identify real time connections.

The objects are reached (cf. page 4 last paragraph) "*by arranging the GPRS system to monitor a transport layer service access point (TSAP) such as a specific UDP (User Datagram Protocol) port, which is used for IP telephony call setup and release signaling.*"

Further explanations with respect to the inventive concept are given on page 5 (second paragraph) and on pages 6 and 7 ("A first / second advantageous embodiment of the invention").

6a. The problems are solved and the advantages are achieved with respect to Claim 1 by a method for managing connections in a packet data radio system, *characterized in that*

- at least data packets **relating to a predetermined allocated transport layer service access point (TSAP) and transmitted by the packet data radio system** are monitored (605) for detecting packets comprising connection state change messages,
- and if a packet comprising a connection state change message is detected, information contained in the connection state change message is used in determining (620) at least one parameter of a packet data connection of the packet data radio system.

6b. The problems are solved and the advantages are achieved with respect to independent Claim 12 by a system for managing connections in a packet data radio system, *characterized in that*

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it comprises

- means for monitoring at least data packets **relating to a predetermined allocated transport layer service access point (TSAP)** and transmitted in the packet data radio system,
- means for detecting a call setup message in a monitored data packet, and
- means for determining at least one connection parameter based on information in a detected call setup message.

6c. The problems are solved and the advantages are achieved with respect to Independent Claim 15 by a network element of a packet data radio system, *characterized in that*

it comprises

- means for monitoring at least data packets **relating to a predetermined allocated transport layer service access point (TSAP)** and transmitted by the network element,
- means for detecting a call setup message in a monitored data packet, and
- means for determining at least one connection parameter based on information in a detected call setup message.

6d. The problems are solved and the advantages are achieved with respect to Independent Claim 19 by a mobile station, *characterized in that*

it comprises

- means for monitoring at least data packets **relating to a predetermined allocated transport layer service access point (TSAP)** and ,
- means for detecting a call setup message in a monitored data packet, and
- means for determining at least one connection parameter based on information in a detected call setup message.

7. Neither the above-mentioned document nor the additionally cited documents of the search report disclose or suggest such features. Thus, the subject-matter defined in the above-mentioned independent claims is considered to be novel and to involve an inventive step (Articles 33 (2) and (3) PCT).

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8. Dependent Claims 2 to 11, 13, 14 and 16 to 18 relate to further details of the method, the system or the network element respectively and are therefore equally novel and inventive (Art. 33 (2) and (3) PCT).
9. Industrial applicability (Article 33 (4) PCT) of the subject-matter claimed is beyond doubt.

**With respect to SECTION VII:**

- 1). Reference signs in parentheses should be inserted in the claims to increase their intelligibility, Rule 6.2 (b) PCT. This applies to both the preamble and the characterising portion.
- 2). Document D1 (EP-A-0 650 286 ) mentioned in the international search report has not been identified in the description nor has the relevant background art disclosed therein been briefly discussed. Thus, the requirements of Rule 5.1 (a) (ii) PCT are not fulfilled.
- 3). On page 16, last paragraph, the closing statement is obviously unnecessary and therefore should be excised from the application (Rule 9.1 (iv) PCT; see also PCT Guidelines chapter III, 4.3a).

- When data packets intended for a mobile station arrive from an external network 80,90, they are first received by a GGSN 60, which routes the packets to the serving GSN 50 of the mobile station 10. If the GGSN 60 does have information about the SGSN of the MS, the GGSN can request location information of the MS from the
- 5 HLR 45. The SGSN forwards the packets to the MS 10 via the base station subsystem 20,30.

Three different classes of mobile stations will be supported. A class-A mobile station can simultaneously use both GPRS and circuit-switched services simultaneously. A class-B mobile station monitors control channels for GPRS and 10 other network services simultaneously, but can use only one type of service at one time, i.e. either packet connections or circuit switched connections. A class-C mobile station can only use GPRS services.

In the GPRS system, a PDP (Packet Data Protocol) context is set up, before a mobile station can transmit or receive information. A PDP context is associated with 15 the service provided by the GPRS system for a PDP address associated with a mobile station. A PDP address is an address for the MS according to the addressing scheme of an external network, to which the MS wishes to communicate. Further, a PDP context comprises entities in the MS, SGSN, and GGSN which control traffic associated with the PDP address. A PDP context comprises also further parameters 20 such as the negotiated quality of service (QoS) and other configuration parameters. Zero, one or more static i.e. permanent PDP addresses may be defined for a mobile station. Dynamic PDP addresses may also be defined for a mobile station. A dynamic PDP address is valid only for the particular connection, for which a dynamic address is defined.

- 25 The GPRS system is described in more detail in the specification GSM 03.60.

## **B. The H.323 specification**

Packet based networks are increasingly used for audio and video transmission as well. The H.323 specification has been created by the International Telecommunications Union (ITU) for the purpose of defining a standard framework 30 for audio, video and data communications over networks that do not provide a guaranteed quality of service (QoS). Examples of such networks are IP-based networks, such as corporate local area networks and the Internet. The aim of the

- The method according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim. The system according to the invention is characterized by that, which is specified in the characterizing part of the independent claim directed to a system. The network element according to the invention is characterized by that, which is specified in the characterizing part of the independent claim directed to a network element. The mobile station according to the invention is characterized by that, which is specified in the characterizing part of the independent claim directed to a mobile station. The dependent claims describe further advantageous embodiments of the invention.

10 According to the invention, the GPRS system is arranged to monitor IP telephony call setup messages, which can be performed by monitoring a transport layer service access point (TSAP), which the IP telephony system uses for call setup signaling. Such a TSAP may be for example a specific UDP (User Datagram Protocol) or TCP (Transmission Control Protocol) port at the IP address corresponding to the mobile station. The term TSAP identifier is used to refer to the particular port number or a corresponding identifier of a TSAP. The monitoring may be performed for example by the GPRS control entities in the mobile station, whereby the control entities are able to determine if the packet connection requires more transmission capacity due to the use of the connection for a real time service such as speech or video.

15 Thereafter the control entities are able to set up a PDP context having a corresponding level of service. Monitoring in the mobile station is advantageous in mobile originated IP telephony calls. The monitoring may as well be performed by a GSN, which is advantageous for mobile terminated IP telephony connections.

20 The invention can be used with any IP telephony protocol, such as the H.323 protocol and the SIP protocol. In the following description several examples are presented within the context of H.323 protocol. However, the invention is not limited to be used in connection with H.323 protocol only, since other IP telephony protocols such as the SIP protocol may as well be used.

25 **Brief description of the drawings**

30 The invention is described in more detail in the following with reference to the accompanying drawings, of which

- As described previously, the invention can be used with any IP telephony protocol, such as the H.323 protocol and the SIP protocol. In the previous description several examples are presented within the context of H.323 protocol. However, the invention is not limited to be used in connection with H.323 protocol only, since 5 other IP telephony protocols such as the SIP protocol may as well be used.

The name of a given functional entity, such as the base station controller, is often different in the context of different cellular telecommunication systems. For example, in the UMTS system the functional entity corresponding to a base station controller (BSC) is the radio network controller (RNC). Therefore, the particular 10 terminology used to denote various functional entities in this specification are only examples according to the GSM system, and do not limit the invention in any way. Further, the various command names recited in this specification are intended to be examples only, and the invention is not limited to using the command names recited in this specification.

- 15 In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention.

**Claims**

1. A method for managing connections in a packet data radio system, characterized in that data packets transmitted by the packet data radio system are monitored for detecting packets comprising connection state change messages, and if a packet comprising a connection state change message is detected, information contained in the connection state change message is used in determining at least one parameter of a packet data connection of the packet data radio system.
2. A method according to claim 1, characterized in that said connection state change messages being monitored are connection setup messages.
- 10 3. A method according to claim 1, characterized in that said connection state change messages being monitored are connection release messages.
4. A method according to claim 1, characterized in that said connection state change messages being monitored are H.323 connection state change messages.
- 15 5. A method according to claim 1, characterized in that said connection state change messages being monitored are connection state change messages according to the SIP protocol.
6. A method according to claim 1, characterized in that the packet data radio system is the GPRS system.
- 20 7. A method according to claim 1, characterized in that the method comprises steps, in which said packet data connection of the packet data radio system is set up at least in part according to said at least one parameter.
8. A method according to claim 1, characterized in that the method comprises steps, in which said packet data connection of the packet data radio system is modified at least in part according to said at least one parameter.
- 25 9. A method according to claim 6, characterized in that said monitoring is performed by a serving GPRS support node.
10. A method according to claim 6, characterized in that said monitoring is performed by a gateway GPRS support node.

11. A method according to claim 6, **characterized in that** said monitoring is performed by a GPRS mobile station.
12. A system for managing connections in a packet data radio system, **characterized in that** it comprises
  - 5 means for monitoring data packets transmitted in the packet data radio system,
  - means for detecting a call setup message in a data packet, and
  - means for determining at least one connection parameter based on information in a detected call setup message.
13. A system according to claim 12, **characterized in that** the system further comprises means for initiating the setting up a packet data connection of the packet data radio system at least partly based on said at least one connection parameter.
14. A system according to claim 12, **characterized in that** the system further comprises means for initiating the modifying a packet data connection of the packet data radio system at least partly based on said at least one connection parameter.
15. A packet data radio system network element, **characterized in that** it comprises
  - means for monitoring data packets transmitted by the network element,
  - means for detecting a call setup message in a data packet, and
  - means for determining at least one connection parameter based on information in a detected call setup message.
16. A packet data radio system network element according to claim 15, **characterized in that** it is a GPRS network element.
17. A packet data radio system network element according to claim 16, **characterized in that** the network element is a serving GPRS support node.
- 25 18. A packet data radio system network element according to claim 16, **characterized in that** the network element is a gateway GPRS support node.
19. A mobile station, **characterized in that** it comprises
  - means for monitoring data packets,
  - means for detecting a call setup message in a data packet, and
- 30 means for determining at least one connection parameter based on information in a detected call setup message.